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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIV NO. 6

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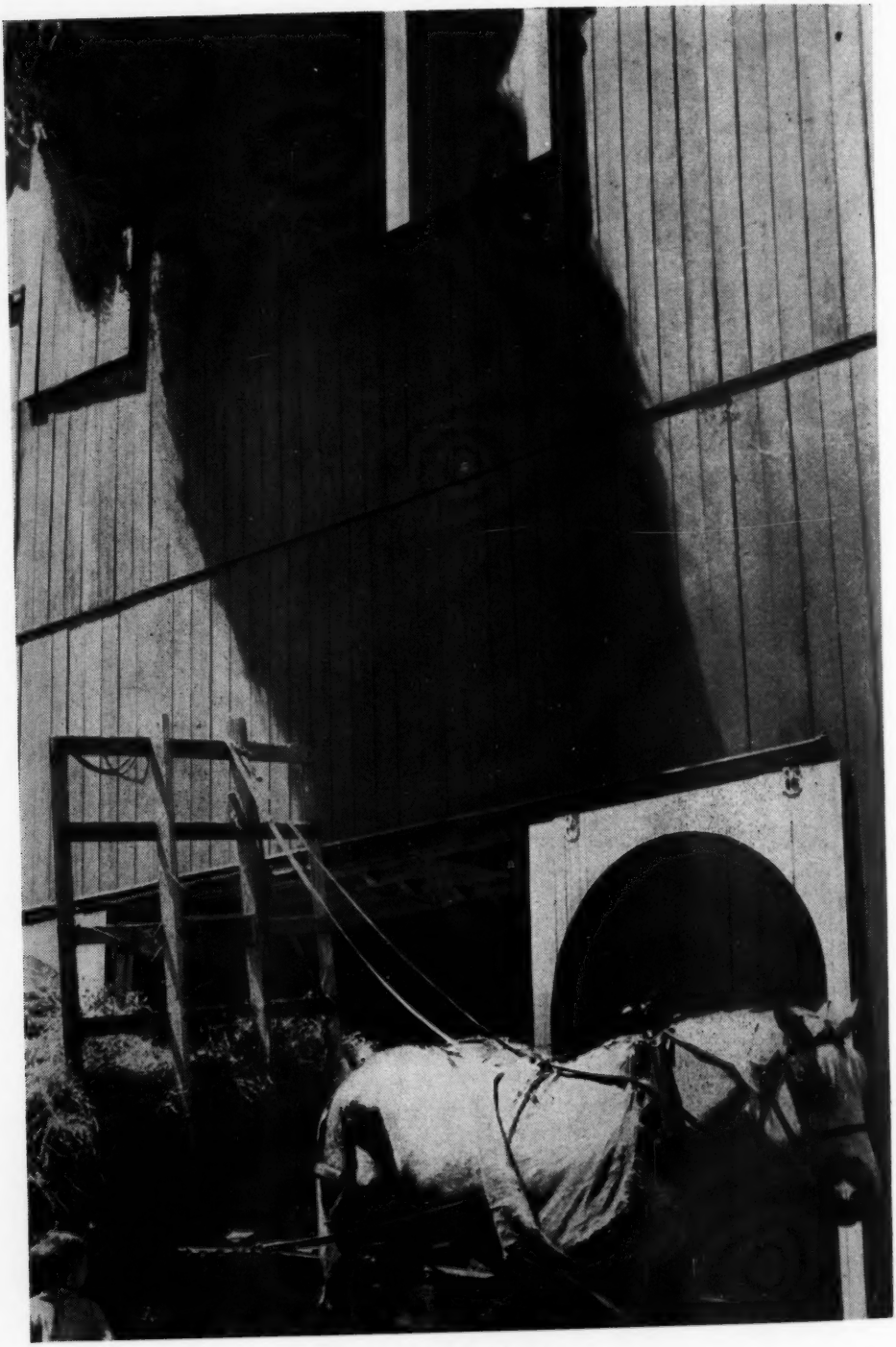

Going Up!

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VOL. XXXIV WASHINGTON, D. C., JUNE–JULY 1950 No. 6

On Thinking Back . . .

Those Were the Days

Jeff McDermid

AS a memory test, or an exercise to bring relaxation and slumber, have you ever tried to recall the names and faces of the boys and girls with whom you graduated from the home-town high school away back, let us say, more than 40 years ago? My recent attempts to catalog those once familiar faces and list those Jims, Janes, and Johnnies whose studious achievements and recess antics figured as the main theme of my life in the late "teens" so long departed have indicated that memory is a flighty thing and old associations too quickly fade.

In all frankness, I was able to remember and jot down the names of only three-fourths of the class roll whose youth and hope were so much in evidence a few years after the turn of the twentieth century. Racking my noodle as best I can has failed to revive the faces and characters of at least five juniors of the early 1900's who marched up the aisle with me to receive those white rolls tied in blue ribbon and bearing the seal and the signatures of the principal and the members of the board of education—a hardware dealer, a plumber, a lawyer, and a traveling salesman. In retaliation, *they* have no doubt long since forgotten *me,* what with life's triumphs and responsibilities and the more pressing and important urge—to work for the future, in this world and the realm to come. To forget each other after years of intervening time is not so vital, after all, as for us to remember the

youth we had and the dreams we shared for making the places we lived in a little better because of ourselves and the children we raised. So, regardless of memory's tricks and failures, we can all join in one acceptable belief—that despite much we have since beheld, those were the "grandest days."

THAT was the grandest age because America itself had just come of age. We juniors, preparing to graduate at that calm period, had for our elders and companions the veterans of the Civil War, which put the cement in our foundations, and the younger fellows whom we saw march off to rescue Cuba and put the U. S. on the world map as a mighty power. To be sure we were roosting on a powder keg in those years from 1900 to 1914. Yet the Germans we knew and played with on the school grounds were all "gemütlich" people of apparent good will and loyalty, mainly the sons and grandsons of sturdy, peaceful, honest citizens who broke away from European goose-stepping to build what was—and is—among our finest national traditions.

They say there has never been a completely warless period in the history of the world, and during those formative times of domestic tranquility through which we studied ancient history and geography the newspapers reported troubles enough between British and Boers and Japs and Russians, and no doubt overlooked many colonial invasions and injustices by the leading countries of wealth and imperialism.

That all these secret deals and schemes of expansion would some day wind up in two bitter wars and find our country trying to salvage what was left of decency and honor beyond our borders—at an investment far exceeding all it took to finance the U. S. and its political subdivisions in our high-school days—we were happily unaware. Moreover, we had not as a whole reached the point when anybody not quite to our liking might be termed a "communist." I know that the bitter-ender Republicans who ruled our state called the Democrats worse names than that, but it lasted only a few weeks in campaign time. We did have grave doubts and no love for Emma Goldman and the crazy "anarchists" and wanted them deported pronto, but we had little of that philosophy to accuse our neighbors with—using our prejudice instead to mutter and grumble at what was called the "A. P. A." So our scene was domestic and world relations were remote.

Turning back to the class again, my own recollection is sharpest for the "junior year" in high school. Then I could sit back and watch the solemn (?) seniors tramp to and fro to the little side classrooms, just "ferninst" the large assembly hall where we had plaster casts of the winged Mercury, the discus thrower, and the Victory of Samothrace on wall pedestals. I thought of those days last summer when walking up the stairs to see the wonderful stone carving of the "Victory" in the Louvre.

IN addition to this watchful waiting for coming honors and final release during the third-year high-school semesters, it was my lot to be cast as the awkward orator to write and deliver what was then regarded as a prominent plum—the Junior Response. I wrote it on old scratch pads and five-cent tablets up in my small bedroom, and memorized it after it was "cleared" with the teachers to improve its syntax and delete its insults.

To this day I can't imagine why the kids selected me for that representative post. I shunned the weekly declamation demonstrations and got weak-kneed every time my turn came to stand up there and quote the classics. But through some self-mesmerism and a resolve not to let them down, I finally spoke my speech to the senior class and got a nice bouquet of carnations sent up from the juniors huddled in an alcove where we had the school library and the picture of George Washington.

I may add that I was not chosen for any such honor when we graduated, not even for the valedictory won by mere grubbing and book learning. Once was enough for all of us. Yet somehow that youthful triumph over self, and its reactions on my outlook, have remained with me as one of the nicest successes it has been my privilege to enjoy. Everybody else has long for-

gotten it, but all the others have some similar personal achievement of their own to brighten and smooth the way.

For graduation finery, the girls of our class wore nice white dresses and blouses, had their hair all in pompadour with little "rats" to roll it back upon, and for outside headgear they wore straw sailor hats. The boys had blue suits; some of them wore white duck trousers and blue coats. I remember our class motto—Incomplete, but Striving—but the colors I "disrecollect." I recall how the Baptist minister in his sermon to us graduates praised our choice of a motto because it carried with it Christian humility and high fortitude. The majority of us who are left out of that handful of graduates probably still feel that the old motto fits them yet.

We had some parties, too, during the festive week and just before. One was held in the high school, and the other was a "progressive" affair with five girls as hostesses in turn at their homes. At the last place we were supposed to wind up with delicious ice cream and layer cake. We got the cake all right, but someone—we suspected the juniors—stole the can of ice cream off the back porch in the midst of our merriment. I have seen but two of those five fine girls in the past 30 years. I miss them more than we missed the dessert, believe it or not.

Those of us who had either stage presence or good looks or good memories were put on the cast for the annual class play. The coach and director chose a flamboyant drama from some current list of those suited to amateurs and picked us kids to fit the parts—my part being the almost speechless one of a butler. My only vocal interpretation of character was in a short dialogue with the housemaid. During the rest of the show I just moved around with cakes and ale. All I had to do was remember my entrance cue and not stumble. The dashing athletic boys had the large parts to portray and, of course, the prettiest girls were the heroines and the luminaries.

SO instantly popular was our drama before the home audience that we were besought to repeat it in town one week later on. Then, to add some income to our high-school social funds, it was decided to take the play "to the provinces." By this I merely mean a one-night stand fifteen miles distant in a country trading post. Thither we "bent our steps" in a big carriage that the livery stable was wont to reserve for funerals, having the local theatrical ticket-man and manager as the driver and second-fiddle chaperon. The determined and efficient coach on the faculty acted as prompter.

But June in our country was a time of sudden thunderstorms and violent winds. That happened to us with a vengeance. We took our lunches along, ate en route, and went direct to the "theater"—a hall that seated 300 persons over a hardware store. It did not seat over 100 that night, owing to the threatening clouds to the west. I think they shelled out 50 cents apiece. Anyhow, I recall that the lightning and the tempest struck hard in the first

(*Turn to page* 40)

Alfalfa—Its Mineral Requirements and Chemical Composition*

By Firman E. Bear and Arthur Wallace

Soils Department, Agricultural Experiment Station, New Brunswick, New Jersey

If alfalfa fields are to be maintained for a number of years, topdressing is essential both for yields and for stand. Originally it had been thought that the weathering processes during winter would release sufficient K to carry the crop through the first cutting of each season. Consequently, most of the topdressings in the test were made after the first crop had been harvested. But K deficiency was so marked on these plots in the early spring of 1947 as to demonstrate that the soil K was not being released rapidly enough to meet the requirements.

For 4½ months, samples of the soil were subjected to continuous artificial weathering, such as would have occurred during the winter, and the amounts of K and P released were measured. The results indicated that the rate of release of K from this soil during winter was not rapid enough to meet the needs of the early spring crop. The amounts of P dissolved were adequate. For this soil, topdressing in early spring appears to be more effective than topdressing after the first crop has been harvested (Table VI). This may apply to other soils as well, since the first cutting is the largest for the year and full advantage should be taken of the better growing conditions at that season. The evidence on plot 5 suggests that a late fall topdressing would be as effective as an early spring application.

As previously indicated, alfalfa has a marked capacity to absorb much larger quantities of K than are necessary for maximum growth. This is objectionable because most of the available soil K may be removed in the first few cuttings after seeding. This difficulty can be overcome by supplying K in increments rather than in large individual doses.

Neither the 60-pound nor the 120-pound annual rate of use of K_2O supplied sufficient K when applied all at one time, and the 180-pound rate involved considerable loss by leaching (Table VII). Since no one cutting appeared to need more than 60 pounds K_2O, an application of that amount after each cutting possibly would produce better results than one single large application each spring or fall, and the danger of luxury consumption would be reduced.

Soils Vary Greatly in Potassium-supplying Powers

As was pointed out, the Nixon soil, on which the field test was conducted, did not supply sufficient K for the first cutting of alfalfa following the winter rest period. The rate of removal of the K supply during the winter months is of vital importance. If one is to know the time as well as the rate of application of fertilizer, he must have an intimate knowledge of the soil in question. If K-deficiency symptoms tend to develop in the first cutting, the alfalfa should be fertilized in late fall or early spring. If not, it may be better to wait until after the first crop has been harvested.

Sandy soils may require more frequent applications of K than heavier soils. The heavier soils are able to store much more K, and they have higher

* The second installment of a reprint of New Jersey Agricultural Experiment Station Bulletin 748, January 1950.

supplying powers for this element. Studies on the K-supplying capacities of 20 important New Jersey soils resulted in classification of the soils in this respect (Table VIII). Rates of application of K can be estimated from this classification and from the expected crop yields. A ton of good alfalfa contains approximately 40 pounds K_2O. Soils having low K-supplying powers may need as much K_2O as the alfalfa takes off the land, whereas those with large supplying powers, such as the Collington, may need relatively little.

Some Soils Have Very High Phosphorus Requirements

Alfalfa is relatively high in P and usually shows marked response to applications of this element. Its effect as a topdressing in this experiment was small but definite. The results indicate that the P content of the crop should not be allowed to fall below 0.27 per cent.

Studies of the 20 New Jersey soils previously referred to (Table VIII) permitted their grouping according to P requirements for alfalfa. Large increases in yield from applications of P were obtained on 14 of the 20 soils, the most notable being that of Penn silt loam. The P content of the alfalfa grown on the 14 was materially increased by the use of this element.

In an over-state field survey of alfalfa, most of the samples that were low in P were obtained from fields in which the pH value of the soil was less than 6.0. Large amounts of P are often needed on acid soils to inactivate the excessive amounts of Al and Mn that become available under such conditions. For alfalfa, a better practice is to make liberal use of liming materials well in advance of the application of P. By this procedure there is less loss of availability of the applied P and more of the soil's natural supply of the element is released for crop use. Relatively heavy applications of P in advance of seeding are believed to be desirable.

Lack of Boron Often a Seriously Limiting Factor

Eight of the 20 New Jersey soils previously referred to (Table VIII) contained less than 0.35 ppm. water-soluble B, a critical value for growth of alfalfa. The water-soluble B content of the soil in the field experiment, however, was about 0.9 ppm., which is considerably more than is required. Accordingly, little or no response was obtained from applications of borax. The B content of the alfalfa on the borax-treated plots increased during the experiment.

Applications of borax are highly important in the production of alfalfa on soils that are deficient in B. Most of the fertilizer sold in New Jersey contains 5 pounds borax a ton. Larger

TABLE VII.—EFFECT OF VARYING ACRE RATE OF APPLICATION* OF K_2O ON 12-MONTH YIELD OF ALFALFA AND K_2O CONTENT OF CROP, AND ON K_2O RECOVERY AND PERCENTAGE K IN CROP.

K_2O Applied	Yield† 3 Crops	K_2O in Hay	K_2O Recovery	K in Three Cuttings		
				1st	2nd	3rd
lb.	*lb.*	*lb.*	*per cent*	*per cent*	*per cent*	*per cent*
0	6,250	56	.....	0.82	1.00	0.50
60	7,400	103	78	1.53	1.20	0.70
120	7,980	131	62	1.58	1.47	0.97
180	8,150	149	52	1.65	2.03	1.38

* K_2O applied after first cutting.
† Yield for the three cuttings that were made within the succeeding 12 months.

TABLE VIII.—RELATIVE NEEDS OF 20 IMPORTANT NEW JERSEY SOILS FOR K, P, Mg, AND B AS MEASURED BY RESPONSE OF ALFALFA TO THEIR USE ON THESE SOILS.

Soils*	K	P	Mg	B†
Collington loam	20	20	14	17
Penn silt loam	19	1	8	3
Dover loam	18	9	18	20
Bermudian silt loam	17	17	16	13
Dutchess shale loam	16	18	15	19
Washington loam	15	8	11	5
Chester loam	14	6	12	4
Hoosic loam	13	10	20	9
Sassafras loam	12	12	4	2
Lansdale silt loam	11	3	19	14
Fox gravelly loam	10	15	9	10
Colts Neck sandy loam	9	7	10	16
Merrimac silt loam	8	16	5	12
Hagerstown loam	7	11	7	18
Sassafras loamy sand	6	14	3	6
Papakating stony loam	5	5	13	15
Gloucester loam	4	19	6	7
Sassafras sand	3	13	2	1
Whippany silty clay loam	2	2	17	8
Lakewood sand	1	4	1	11

* The most marked response of alfalfa to the use of the element on these soils is designated by 1 and the least marked or no response by 20.
† The need for B was measured by hot-water extraction rather than by the response of alfalfa to the use of the element.

amounts, up to 25 or 30 pounds borax an acre, should be applied each year to alfalfa on soils suspected of being low in B. Soils of the Sassafras and related series are notably deficient in this element (Table IX). Those of the Collington series are not. Marked response to the use of borax on alfalfa has been observed on many soils about the state. At least 12 per cent of the soil in New Jersey contains less available B than is required for maximum crop yields.

Nitrogen Fertilizers Favor Grass and Weeds

It has been demonstrated that N is of considerable value in establishing a new seeding of alfalfa. When it was used as a topdressing on established stands, however, its effect was not marked, although significant increases in yield were noted. Cow manure, each ton of which carries about 10 pounds of N, is known to be valuable for topdressing alfalfa. But this may be due to the

TABLE IX.—EFFECT OF BORAX ON ACRE YIELD OF ALFALFA HAY ON SOILS OF SASSAFRAS SERIES.

Borax per Acre	Acre Yield of Alfalfa Hay	
	Sandy loams*	Loamy sands†
lb.	*lb.*	*lb.*
0	5,205	3,274
10	5,754	.....
20	6,454	5,029
40	7,052	.....

* Mean of three cuttings on each of two farms.
† Mean of two cuttings on each of two farms.

equally high K content of the manure, which may offset the disadvantages of the N it supplies. It may be worthwhile to topdress some fields with N, but this promotes the growth of weeds and grasses more than that of alfalfa (Table X).

The response of chickweed and crabgrass to N in this field experiment was an illustration of the operation of this principle (Table X). Part of the response was the result of K depletion. On one of the low-K plots, alfalfa contained only 0.8 per cent K, in contrast to 2.0 per cent in timothy. If the timothy had been stimulated with extra N, it would have competed even more seriously with the alfalfa for the available soil K. Alfalfa did well in association with timothy when topdressings at the rate of 120 pounds K_2O, 120 pounds P_2O_5, and 20 pounds borax an acre were applied annually to a mixed stand of these plants.

Lime Effective as Topdressing

The plot that received 1,000 pounds $CaCO_3$ as an annual topdressing showed a definite yield increase. By 1948, the pH value of the unlimed soil of this experiment had dropped to around 6, which is probably too low for best results with alfalfa. As the soil acidity increases, the nodule bacteria probably fail to function properly.

When lime is applied as a topdressing, the rate of movement downward in the soil has been reported to be 1 to 2 inches a year. But in the plot that was topdressed with $CaCO_3$, the pH values of the soil of both the plow depth and that below it were higher than those of the corresponding depths of soil of the neighboring plots.

Adequate liming presents a difficult problem on the sandier soils of south Jersey. These soils tend to become acid more rapidly than the heavier soils farther north. Consequently it is common for the southern soils to develop too much acidity for alfalfa within a year or two after the crop has become established. Under such circumstances, topdressing with some readily available form of lime has important possibilities.

Growth of alfalfa may be depressed following the use of unduly large amounts of liming materials on such soils. A field in Burlington County, on Collington sandy loam, showed evidence of such injury. Examination revealed that the soil had a pH value above 7. One result of liming to such high pH values is the loss in availability of some of the minor elements, notably Mn. When manganese sulfate ($MnSO_4$) was dusted on the alfalfa, the plants recovered quickly. It is believed that the coarser grades of limestone may be of special value on sandy soils in maintaining the pH value at suitable levels over longer periods and with less damage of overliming.

TABLE X.—EFFECT OF K AND N TOPDRESSINGS ON ALFALFA VS. WEEDS.

Plot	Treatment	Cutting Date	Alfalfa	Weeds
	lb./A.	1948	*per cent*	*per cent*
23	0	June	69	31
8	180 K_2O	June	94	6
23	0	August	15	85
12	60 K_2O +60 N	August	23	77
3	60 K_2O	August	73	27
8	180 K_2O	August	88	12
		1949		
23	0	June	13	87
4	60 K_2O	June	65	35
21	120 K_2O	June	91	9
8	180 K_2O	June	99	1

Mg deficiency has been observed on a wide variety of New Jersey crop plants. The three plots in this experiment that received soluble Mg did not produce significantly higher yields than comparable plots to which it was not applied. But many New Jersey soils are deficient in this element. Lack of Mg tends to become a limiting factor in alfalfa production when the content falls below 0.24 per cent of the dry weight. Marked response to applications of soluble Mg was obtained with alfalfa on 7 of the 20 soils previously mentioned (Table VIII), notably on those of the Lakewood and Sassafras series.

Since Mo is known to be an essential element for the nodule bacteria of legume plants, sodium molybdate ($Na_2MoO_4 \cdot 2H_2O$) was applied at the rate of 5 pounds an acre annually as an extra topdressing on triplicate plots of the field experiment. This raised the Mo content of the plants from 0.8 to 3.4 ppm. and that of the roots from 0.3 to 9.5 ppm. The yield increase from the use of Mo was of doubtful significance. The N content for alfalfa receiving Mo was 3.08 per cent, however, compared with 2.90 per cent for that not receiving it. This was a significant difference.

Lime increases the availability of soil Mo, and this may be one of the very important reasons for its special usefulness on alfalfa. Since the amount of Mo required is only a few ounces an acre, the best procedure in supplying it might be to dust the oxide or the Na salt of the element over the seed. Continued application of unduly large amounts of Mo could result in alfalfa that contained more than 10 ppm. of the element, a level that might well be toxic to livestock, especially if the plant was eaten in the green state.

Other Elements Sometimes Missing

Alfalfa requires about as much S as P, but lack of S is not believed to be a limiting factor in New Jersey. Considerable amounts of S are added to the soil in the rain water. Large additional amounts are supplied in the form of superphosphate. As previously indicated, lack of Mn may be a limiting factor on some soils, notably those that have been overlimed. Fe, Zn, and Cu are also needed by alfalfa. Little is known about the status of these elements in the soils of the state, but studies of them are now under way. There is reason to believe that some New Jersey soils are low in cobalt (Co), but this does not limit crop yields, since, so far as is known, this element is not required by plants. It is, however, essential to animals.

Sodium Has Value When Potassium Is Low

Alfalfa does not accumulate large quantities of Na, but it is improved by an application of salt (NaCl) when K is low. The Na content of alfalfa plants receiving no NaCl was very low, generally about 0.02 per cent, when sufficient supplies of K were available. Applications of NaCl resulted in increasing this content threefold or fourfold. The Na content of the roots appeared to be greater than the K content.

The results in Table IV reveal that topdressings of NaCl, in addition to those of K, materially increased yields. In proportion as lower quantities of K fertilizers are applied, the benefit from the use of NaCl would no doubt be increased. This does not mean, however, that NaCl is, as yet, recommended as a material for use in fertilizers for topdressing this crop.

Chlorides Reduce Nitrogen Content of Crop

The K in the field experiment was applied as KCl, and the Cl percentage in the alfalfa increased with increasing applications. As the Cl increased, the N decreased, so that the milliequivalent sum of the Cl+N anions was virtually constant. The Cl had no influence on the content of P and S in the alfalfa. The larger part of the decrease in the N percentage, however, was due to the

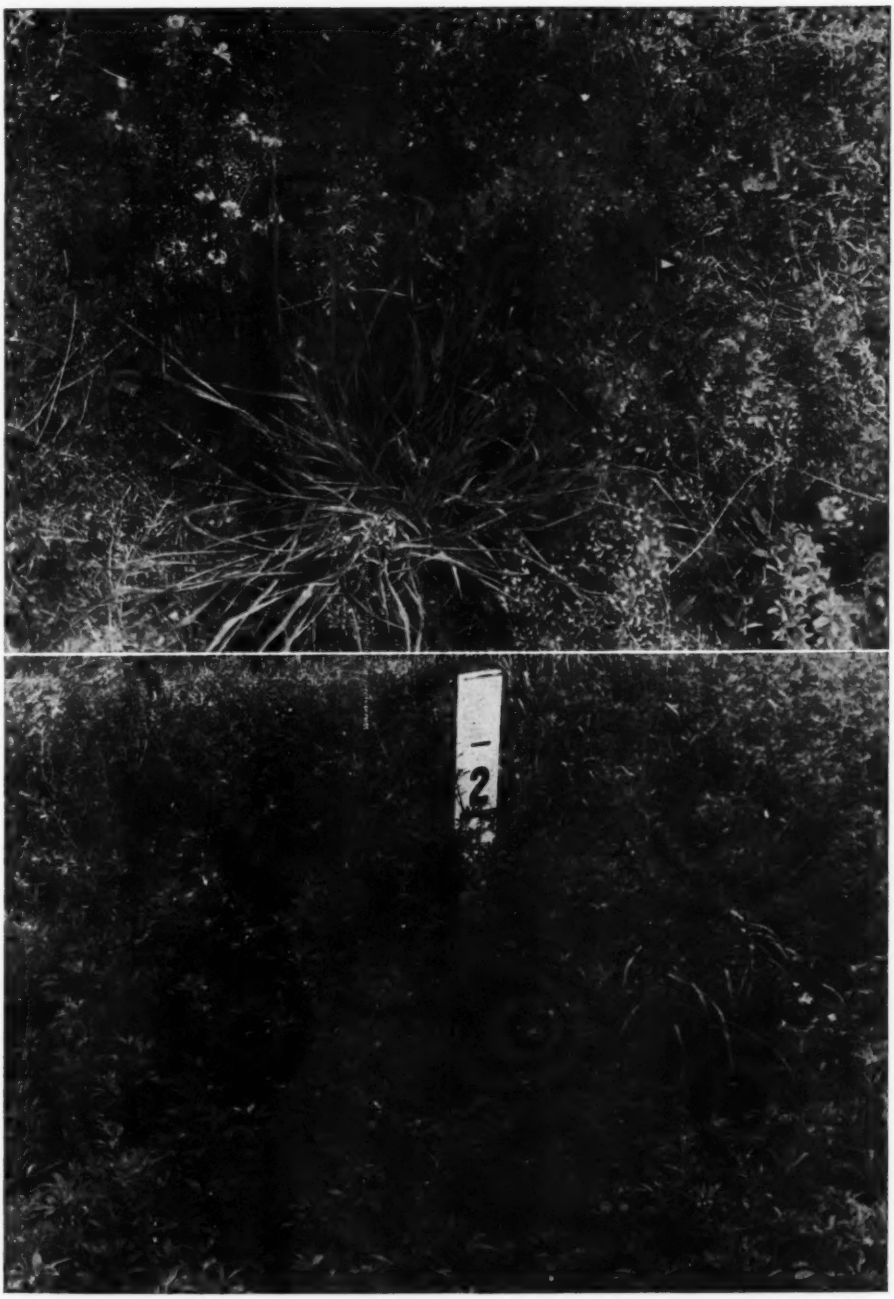

Fig. 7. Top—In absence of adequate amounts of potassium, weeds tend to crowd out alfalfa. Bottom—When the soil is kept well supplied with potassium, a good stand of alfalfa can commonly be maintained for 5 or more years.

greater growth of stems. Thus the alfalfa grew more luxuriantly following the use of K, and there was a smaller ratio of leaves to stems on the K-fertilized plants than on those that received no K.

The range of Cl in alfalfa was between 0.04 and 0.48 per cent. Dock and dandelion contained more than 1 per cent Cl, and broadleaf plantain as much as 1.92 per cent. There was sufficient carry-over from a 300-pound application of KCl in 1947 for alfalfa to contain 0.20 per cent Cl and dandelion 0.64 per cent in the early spring of 1948.

Weeds Compete with Crop for Potassium

Weeds were important factors in determining the total yields of alfalfa in the field tests. Where the available soil K was low, crabgrass and other weeds were able to grow vigorously (Table X). In the third cutting of 1948, 85 per cent of the dry matter from the plots not receiving any fertilizer since seeding consisted of crabgrass. In another plot, where more but still insufficient K was applied, crabgrass and other weeds comprised 27 per cent of the forage. In the plot that received the highest amount of K, it was only 12 per cent. Dandelion, broadleaf plantain, dock, and shepherd's purse were very abundant in the K-deficient plots (Fig. 7).

The weeds contained much larger percentages K than the alfalfa that was growing on the same plots, whether the soils were deficient in K or not (Table XI). The amounts of K in these plants were related inversely to their Ca content. As a rule, plants that were low in Ca were able to obtain considerable amounts of K from K-deficient soils, whereas those like alfalfa that were high in Ca suffered from a lack of K. Afalfa has poor competing power with other plants, unless it has plenty of K at its disposal.

Plants compete with one another for water, light, and minerals. The competitive weapons are height, size and spread of leaf, depth of root, quickness of germination and growth, and resistance to drought, frost, or winter-injury. Weeds have initial advantages over alfalfa but, unless they are perennial, alfalfa takes over during the second year. Later the weeds return, unless the fertilizer and liming program is such as to continue to favor the alfalfa. Alfalfa-grass mixtures, as permanent crops, are in opposition to

(*Turn to page* 37)

TABLE XI.—RELATIVE K AND CA CONTENT OF 1948 ALFALFA AND WEEDS IN ME.* PER 100 GM. DRY MATTER.

Plant	No K Applied		K Applied	
	K Content	Ca Content	K Content	Ca Content
	me.	*me.*	*me.*	*me.*
Spring, 1948				
Alfalfa	15	108	35	85
Dandelion	36	39	83	41
Shepherd's purse	42	44	74	45
Fall, 1948				
Alfalfa	12	105	30	77
Broadleaf plantain	14	173	53	165
Crabgrass	32	24	72	21
Dock	40	53	90	75

* See footnote 4 for factors to translate me. values into percentages.

Further Photographic Hints for Agricultural Workers

By Ross E. Hutchins

Agricultural Experiment Station, State College, Mississippi

IN a previous article in this magazine, consideration was given to some of the general photographic problems that confront the agricultural worker. In this article it is proposed to go into some of the more technical aspects of the subject.

The subject of lenses is one about which the average camera owner knows very little, yet this round piece of glass is the heart of the camera, as well as the most expensive part, and determines the quality of the pictures. You may have all sorts of gadgets on your camera but if the lens is poor your pictures will be poor. You can test your lens very easily. Focus your camera upon a newspaper or other large printed surface brought as close to the camera as your focusing adjustment will permit. Take a picture and study the result. Note especially the corners of the test shot. Are they as sharp as the center? Do all the letters stand out sharp and clear? If not, your lens is poor. It is also poor if your negatives won't stand at least four diameters enlargement without blurring sharp lines.

Before leaving the subject of lenses, the question of "coating" should be mentioned. Most of the new cameras are equipped with coated lenses. This coating consists of a layer of fluorine atoms that is placed upon the lens surfaces electrically and which cuts down reflection. You can tell if your lens is coated if you examine it by reflected light. A coated lens will show purple or blue reflections. There is no other one thing that will aid you in getting sharper and clearer pictures than to have your lens coated by

Fig. 1. This is a "high angle" shot. It is often an advantage to mount the camera on top of a high truck or ladder to obtain such shots.

a reliable firm. If your lens is not already coated, you can have it done for from $15 to $20 and you will find it well worth the money. Reliable firms will usually repolish and recement your lens in addition to coating it. Small scratches on the front of the lens are not too important, but scratches on the back element will harm picture sharpness. Small bubbles in the glass of a lens do no harm. In fact they are a mark of quality. Do not clean your lens with the first piece of rag that comes handy; use regular lens tissue or "Kleenex."

In purchasing a camera the subject of lens focal length often comes up and may cause some doubt. Focal length of a lens is the distance back of the lens at which the light rays that form the image converge. Now, if you are buying a press type camera, for example, the focal length of the lens will make a great deal of difference. The focal length of the lens you buy depends upon the use to which you expect to put your camera. If you expect to photograph livestock mostly, you will want one with long focus so that you can obtain a large image and not have to be too close to the subject. This is often important. The writer recalls a long session of hiding in a truck with P. H. Sanders of the Mississippi Experiment Station, waiting for some wild cattle to approach close enough for a color shot through a knot-hole in the truck body.

If many of your pictures are to be made of interiors where quarters are often cramped, then you will want a camera with a short focus lens to give you wider angle. Fair exhibits are hard to photograph because in most cases it is difficult to get back far enough to include all of the average exhibit. Probably the best solution to the problem is to have your camera equipped with a moderately long focus lens and then obtain a slip-on, wide-angle lens that is slipped on over the regular lens, thus increasing the angle. This will change the focus, however, and you will then have to use a tripod and focus by means of the ground glass. This is usually best anyway.

Color Filters

Whether or not to use color filters is a question that is often pondered over

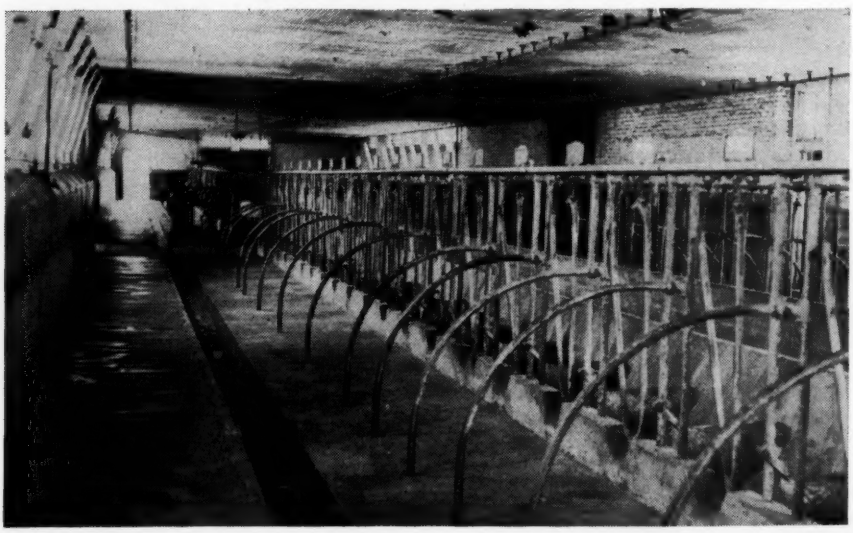

Fig. 2. Well-lighted interiors such as this may often be photographed without any artificial light. In this case the camera was placed on a tripod and a long exposure used. Also, since great depth of field was needed, the diaphragm was closed down to f.22.

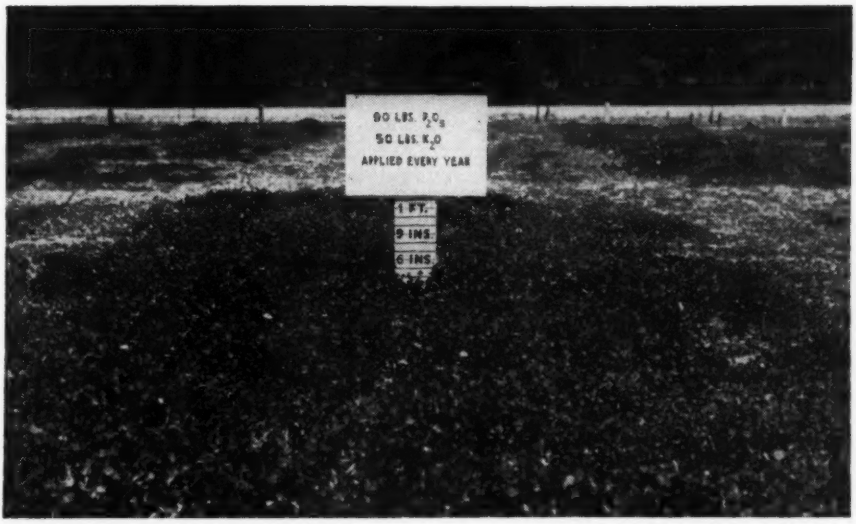

Fig. 3. This picture illustrates what can be done with a roll film camera. This photo, taken on 620 roll film, will not stand the enlargement possible with larger negatives, but in other ways it compares favorably with the big cameras.

by agricultural workers. This question can hardly be answered by yes or no. It all depends upon the subject. If you are photographing a flock of chickens in a barnyard or a close-up of a prize bull, there is no advantage in using a color filter. Probably the only instance where the average worker can improve his pictures by filters is in field scenes having nice cloud effects overhead. Usually such clouds will not show unless a filter is used, and they often will dress-up an otherwise dull picture. Color filters are colored pieces

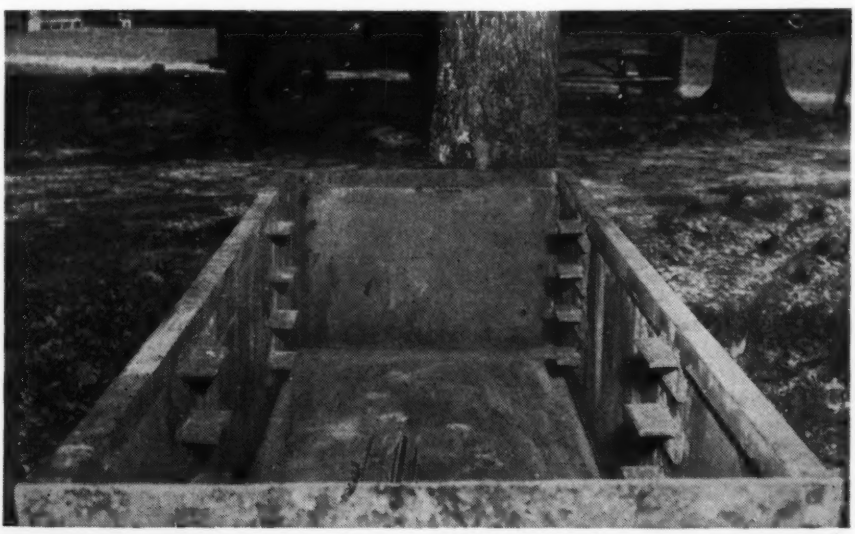

Fig. 4. Flash can often be employed to supplement daylight. In this case the vat was under a large tree in dense shadow. The flash was used to light up the interior of the tank which otherwise would have been completely black.

of glass, carefully made to cut out only a certain portion of the sun's light. They are placed over the lens of the camera while the picture is made. These filters are made in many different colors and are designed for different uses. Probably the only ones that are of interest to us here are the yellow and orange types.

A yellow filter (K2) is useful in bringing out clouds in a scene, and it is necessary to double the time of exposure when using it. The orange filter (G) does about the same thing but to a greater degree. Be sure to triple your exposure for the "G" filter. These filters will often give a nice, pictorial effect to pasture or field scenes. If you are not using a coated lens, you may often get a white halo about white objects in bright sunlight. This is true of white buildings or people in white clothing. Usually a yellow filter will correct this. Filters are important enough so that your kit should contain at least a yellow one and a holder to attach it to your lens.

The Use of Flash

There are two methods of taking pictures in the interiors of buildings. One is by the use of photoflood bulbs in reflectors, and the other is by means of flash bulbs in a flash gun attached to the camera. The latter is by far the most convenient because nothing but the camera and the attached flash apparatus need be carried along. Most news pictures are made by this method. The chief difficulty with the flash is that there is usually little control over the light and in many instances dense shadows are produced in the wrong places. However, taking everything into consideration the flash apparatus is generally the most usable and a good flash gun should be a part of your outfit. Flash bulbs come in different sizes and prices. For average small rooms or for close-ups, the small bulbs with bayonet bases called No. 5 Press are satisfactory. If your flash gun is equipped to take only screw base bulbs, you can obtain an adapter for a few cents. For larger interiors No. 22 Press flash bulbs are satisfactory.

If a great many pictures are to be made at one location, it may be cheaper and better to obtain reflectors and use photoflood bulbs. By this means you have better control over the light

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Fig. 5. Clouds in a picture often add greatly to the scenic effect. In this case the clouds were brought out by means of a K2, Yellow Filter.

Fig. 1. Showing various degrees of potash starvation symptoms on peach leaves (left to right), from a very slight cupping of the leaves to very severe cupping accompanied by marginal yellowing and some reddening of the lower leaf surfaces and twigs.

Potash Tissue Test for Peach Leaves

By H. L. Garrard

Homewood, Illinois

THE nutrient needs of orchard trees are not so readily predicted by soil tests, because the roots penetrate into layers of topsoil and subsoil of variable fertility. To date, the percentage of total potassium (K) in the dry leaf tissues determined by official chemical methods has been the most dependable diagnostic procedure for potash needs of orchard trees. But total potassium determinations, as used in the "leaf analysis" methods, are time-consuming and expensive. Often the data are not available during the growing season concerned. Many have recognized the need for more rapid tests to be used on green leaves in the field.

A modification of the Purdue tissue test for potassium has been made, adapting it for use on peach tree leaves for diagnostic purposes. This tissue test, as originally outlined in Bul. No. 384, Purdue Agricultural Experiment Station (1933), was first designed primarily for use on corn plants, but has been used extensively for diagnosing the nutrient status of many crops. Later the same test was adapted for use on soils as well as plants. This is described in Purdue Agricultural Experiment Station Circular No. 204 (issued 1934, revised 1945), titled "Use of Rapid Chemical Tests on Plants and Soils as Aids in Determining Fertilizer Needs."

Shortly after publication of the Pur-

due potash tissue test technic, the test was tried out on orchard tree leaves with somewhat unsatisfactory results. This account is intended as a review of some attempts to modify and calibrate the test for use on orchard trees.

Robert Anderson Discovers Potash-deficient Orchard

This story starts September 24, 1941. Robert Anderson of Covert, Michigan, showed the writer a potash-starved peach orchard on the farm of Matt Thar near Hartford, Michigan. Mr. Anderson, who is very observant and familiar with the literature on nutrient deficiencies, already had correctly diagnosed the symptoms as potash starvation.

Among the 2,800 three-year Elberta and Hale Haven peach trees in the Thar orchard were several areas where the leaves were very abnormal. They were cupped upward and inward into bean-pod shapes, the under sides reddish with some yellowing or mottling between veins (see Fig. 1). In severe cases interveinal areas near leaf margins were brown, and sometimes necrotic areas would drop out leaving holes in the leaf. Some trees were less severely affected, so that only leaves on the topmost branches would show some cupping but little abnormal discoloration. Most of these 3-year trees had made plenty of new wood growth these first years, but the diameter of the new wood was small in 1941, especially on those trees showing these severe symptoms.

The symptoms were somewhat suggestive of a possible "virus" disease. Similar symptoms had been found and described on trees whose trunks had been injured by borers or freezing. But the symptoms in the Thar orchard corresponded with the published descriptions of potash hunger, and Mr. Anderson's diagnosis was unquestionably correctly made.

This field had been in alfalfa for 10 years, with all hay sold, no manure returned, and no potash added. When the alfalfa "ran out," crops of wheat, corn, and oats followed just before the setting of the young peach trees. Soil tests in 1941 showed the pH varying from 6.6 to 7.2. The field had been marled heavily in 1924 to grow alfalfa. Here was a fine sandy loam soil, naturally low in available potassium. Then it had been drained of what potash was available by continuous alfalfa.

Experiments Prove Potash Need

A simple experiment was started in the Thar orchard October 10, 1941, applying 4 lbs. K_2O per tree, with and without phosphate. By July 1942, the potash-treated trees had healthy green leaves, while those without potash showed definite potash starvation symptoms, but less severe than in 1941. A proper fertilization program, using 0-9-27 in addition to nitrogen, has resulted in a high-producing peach orchard with good quality fruits since 1943.

Anderson Diagnosis Confirmed by Tissue Tests

Tissue tests by the original Purdue method indicated a "very low" potash in the Thar peach leaves in 1941. Then abnormal leaves from the potash-starved trees and normal leaves from

TABLE I. TISSUE TESTS AND LEAF ANALYSES, 1942: MATT THAR ORCHARD, HARTFORD, MICHIGAN

Treatment	Symptoms, 1941	Symptoms, 1942	Potash Tissue Test	Total K
None	Severe	Moderate	Very low	.50%
8# 0–0–50	"	None	Very high	2.13
20# 0–20–20	"	"	" "	2.48

the potash-treated trees in the Thar orchard were tested by the Purdue method in 1942. These fertilizer results proved that tissue tests could be used for diagnostic purposes. (See Table I.)

Modified Potash Tissue Test

Using the regular Purdue potash test on certain tree leaves, a brownish discoloration of the extracting solution interfered with an accurate estimate of the amount of precipitate. The "very low" readings could be detected because the solution would be clear even though discolored, but it was difficult to estimate the higher readings. The first variation tried was to filter out the plant material from the extracting solution after shaking, before adding the alcohol. This facilitated estimating the amount of precipitate in the discolored solution, but still did not solve the basic problem of the control of the discolored solution.

While at Purdue University, S. F. Thornton used a potassium-free carbon black clearing agent added to the mixture of plant tissue and extracting solution (No. 1) to adsorb such discoloring material. This mixture was then filtered, and alcohol added to the filtrate.

But the introduction of this clearing agent produced other problems. The extracting solution (No. 1) of the Purdue potash test contains the precipitating agent, sodium cobaltinitrite. The carbon black adsorbed some of the sodium cobaltinitrite as well as the discoloring material from the leaves. Where leaves were "very high" in potash content, some precipitation would start without the addition of alcohol. This potassium would be retained on the filter paper along with the plant materials and the carbon black, giving a lower reading than expected after the alcohol was added to the filtrate. Accordingly it seemed necessary to keep the precipitating agent out of the solution until the extraction and filtration were completed.

It was evident that a new extracting solution was necessary. Therefore, a solution of 15% sodium nitrite ($NaNO_2$) acidified to pH 5.0 with acetic acid was used. This is virtually the same as the Potash Solution No. 1, less the sodium cobaltinitrite. With this one extra solution and the carbon black, such as DARCO G60, the modified test gives satisfactory results.

The modified test is not presented as the final word, but only as an improvement over the original method for this particular purpose.

Modified Potash Tissue Test

1 tsp. finely cut peach leaves in vial
10 cc 15% $NaNO_2$ solution. (Part of No. 1)
1/8 tsp. carbon black clearing agent, such as DARCO G60
Shake 1 minute
Filter

(If air temperature is above 75°, then use water bath to control temperatures, preferably 65–70° F, for following precipitation procedure.)

Place 2.5 cc filtrate in clean vial
Add 5 cc Potash Solution No. 1
Mix thoroughly
Add 2.5 cc Potash Solution No. 3, by running down side of tube to get layer of alcohol on top
Let stand 1 minute to start precipitation
Mix in alcohol slowly by rotary motion
Let stand 3 minutes
Read by chart with black lines, as shown in Purdue Cir. No. 204.

Potash Solution No. 1. Dissolve 5 grams of sodium cobaltinitrite and 30 grams of sodium nitrite in distilled water, add 5 cc of glacial acetic acid, make to 100 cc volume, and allow to stand for several days. Add 5 cc of this solution to a solution of 15 grams of sodium nitrite in 100 cc of distilled water and adjust to pH 5.0 with acetic acid. Sodium cobaltinitrite from different sources has been found to vary widely in cobalt content. The directions given here are based on the use of the "Baker's Analyzed" product. Cobaltinitrite concentration is an important factor in determining the sensitivity of the test.

Potash Solution No. 3. Ethyl alcohol (95%). When ethyl alcohol for use as a reagent is difficult to obtain, a mixture of 60 parts anhydrous methyl alcohol, 40 parts anhydrous isopropyl, and 5 parts of distilled water may be substituted. If this mixture becomes turbid it should be filtered. Completely denatured alcohol is not satisfactory.

Special Extractant. Dissolve 15 grams of sodium nitrite in 100 cc of distilled water, and adjust to pH 5.0 with acetic acid.

Modified Potash Tissue Test Proves Satisfactory

The most important contribution toward calibrating this tissue test for potassium in peach leaves was made during 1947 and 1948 by William H. Daniel of the Department of Soil Science, Michigan State College. He used the modified procedure in various ways —(1) comparing tissue test results with total potassium (K) contents of peach leaves, and (2) studying the relation of potash deficiency symptoms to the potassium content as indicated by tissue tests and "leaf analysis." The results of one of these studies are illustrated in Fig 2. For further details, see Michigan A.E.S. Quarterly Bulletin, Vol. 32, No. 2, pp. 199-205, Nov. 1949, "Methods for Determining the Needs of Peach Trees for Potash Fertilizer."

Kerlikowski Orchard Tests

The results reported herewith are based upon tests on peach leaf samples collected from individual trees in a fertilization experiment in the orchard of Eric Kerlikowski near Watervliet, Michigan. The original fertilizer experiment was started in 1944 by T. A. Merrill, Department of Horticulture, and J. A. Porter, Department of Soil Science, Michigan State College.

Severe potash deficiency symptoms had developed in this orchard in 1944, about two years after setting out the peaches following alfalfa. The alfalfa, on a sandy loam soil, had not been adequately fertilized. The severity of deficiency symptoms on the no-potash trees in this orchard decreased gradually from 1945 to 1948, while the average percentage of potassium in the leaves increased gradually each year from .587 to .753, to .827, and to .993% K respectively. It is assumed that this gradual increase in potassium was due to two factors—(1) the extension of the tree roots into wider and deeper feeding areas, and (2) the natural release of soil potassium into more available forms.

Observations of symptoms on the Kerlikowski trees and the corresponding potassium contents of the leaves confirm the general relationship that peach leaves with less than 1% K usually show some potash deficiency symptoms. When definite symptoms were evident, it was fairly certain that both tissue tests and leaf analysis would indicate "low" to "very low" potassium. There may be small differences in tests between those showing slight and severe degrees of symptoms, but all will be in the "low" range or below. Some leaves which appear healthy contained less than 1% K by ash analysis and "low" by tissue tests.

From observations of different varieties of peaches growing under low potash conditions, it seems that the Red Haven variety often shows more severe potash deficiency symptoms than some other varieties such as Elberta and Hale Haven growing under similar conditions. Further work is needed to determine the relative needs of the varieties for potash to assure both the best yield as well as eating and shipping quality.

Interpretation and Use of Graph

The potassium contents of the leaves were determined by the more exact ash analysis method and compared with readings made by the more rapid modified Purdue tissue test method. These are charted on Fig. 2. Perhaps the details of the development of the graph should be explained more fully to be of practical use. On the vertical axis are graphed the percentages of potassium (K) in the dry leaves by the ash analysis method. The horizontal axis represents the ppm of potassium (K) in the extract of green leaves as in the tissue test. For research purposes the potash precipitates in tissue tests were measured by the use of a photoelectric colorimeter (Cenco Photolometer), calibrated against standard solutions containing up to 400 ppm of K.

For comparative purposes, just above the ppm scale, have been superimposed

the ranges of the "very low" to "very high" when these same test precipitates were judged visually by the Purdue potash test chart.

Dotted lines have been extended vertically from between these "very low" to "very high" ranges to bisect lines extending horizontally from certain points on the per cent K axis. Three arbitrary points might be termed the "severe symptom level" (.7% K), "adequate level" (1.5% K), and "maintenance level" (2.0% K), as indicated by a general survey of the literature. That is, when the potassium in peach leaves approximates .7% K, severe potash deficiency symptoms usually develop unless masked by other limiting factors. Some symptoms may appear even up to the 1% K level. When peach leaves contain as much as 1.5% K at fruit harvest time, then the potash supply is considered "adequate" by some authorities.

It is evident that a simple technic as used in this tissue test is far from quantitative, and therefore the readings may not be expected to correlate perfectly with quantitative determinations. There are many possible factors which might cause tissue tests to vary slightly, such as degree of maceration of cells while cutting, length of filtering time, variation in precipitates due to method of adding or mixing in alcohol, or variable temperatures of solutions. The main question is—did the tissue tests classify fairly accurately the tree leaves into groups of low and high potash content?

Note in Fig. 2 that all leaves from trees without added potash were classed in the relatively low potash ranges by both methods of analyses. Leaves from potash-treated trees were mostly in the "very high" range, as might have been expected. A second application of potash was made on these

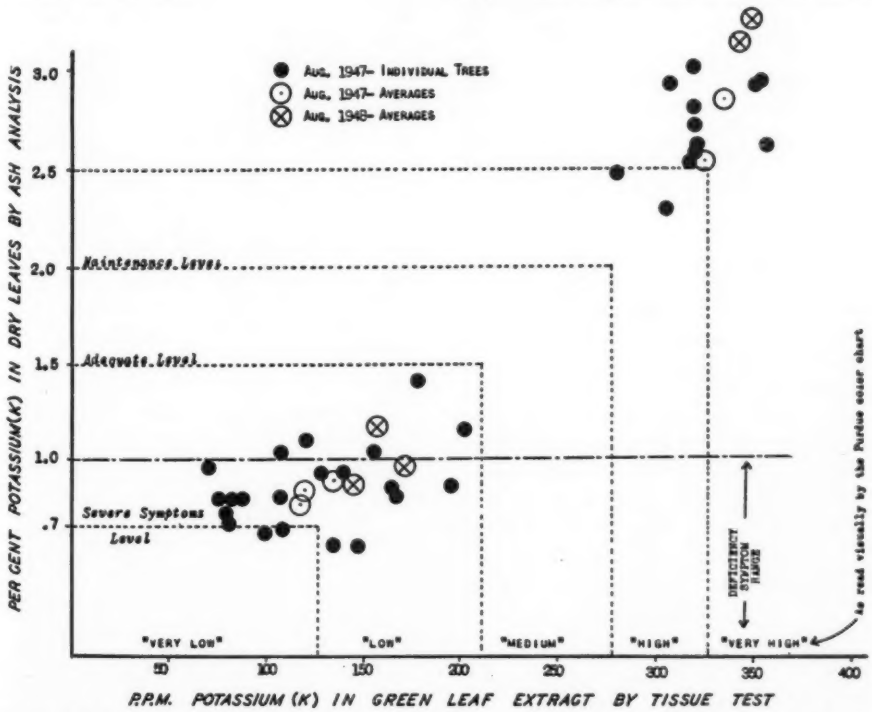

Fig. 2. Comparison of potassium tissue test results on extracts of green peach leaves with percentages of potassium in dry leaves as indicated by ash analyses. Also shows general relation of per cent potassium (K) in peach leaves to the appearance of deficiency symptoms.

trees in the spring of 1948, so it is natural that the 1948 percentages in the potash-treated group should have been higher than in 1947.

Some of the most important conclusions from Mr. Daniel's work as illustrated in Fig. 2:

(1) The results of tissue tests made on green leaves compare very favorably with the percentage of potassium (K) in the dry leaves by the ash analysis method.

(2) The modified tissue test can be used to detect potash-hungry peach leaves, that is, leaves with less than 1.5% K by the ash analysis method.

(3) The visual readings of tests by use of the potash color chart in Purdue Cir. No. 204 compared favorably at lower ranges with indications of potash deficiency by leaf analysis as well as observations on leaf symptoms. But the median between the "medium" and "high" ranges according to the chart may be slightly above the "adequate" potash content of peach leaves by ash analyses.

From our limited experience to date, it seems probable that a different calibration may be necessary for crops other than peaches, such as plums, cherries, apples, etc. The requirements of the various crops may be different. Also, for some reason, higher potash test readings have been obtained with plum leaves than with peach leaves, even though both have the same total potassium by the ash analysis method.

Suggestions for Sampling Trees and Testing Tissues

Potash deficiency symptoms become progressively worse during the latter half of the season, and in some cases symptoms may not be very distinct until after July 1 in Michigan. It is assumed that samples for diagnostic analyses should be taken during the period when symptoms appear on trees growing at starvation levels. This will be during the latter half of the growing season, preferably just before harvest time. However, do not take tree leaf samples for analyses very late in the season, especially after abscission begins.

Samples in Michigan should be taken in August or early September, depending on the variety. At this period there probably will be the greatest relative difference between the K contents of potash-starved leaves and those with adequate potash supplies. There is a tendency for a gradual lowering of the K content toward the latter part of the season even though the leaf may have had 1.5 to 2.0% K at harvest time. Leaves from the mid-portion of the new wood have been used for the tests reported herewith as they showed the most deficiency symptoms.

Mr. Daniel's research has confirmed the adaptability of the original modification of the test, with the exception that in most cases he advises using the smallest amount of carbon black clearing agent necessary to clear the extract. The amount of the clearing agent must be held constant in any series of tests in order that results will be comparable.

Uniform cutting of the leaf sample is necessary, because the extraction depends upon the sap from the ruptured cells. Cut leaves uniformly into ⅛-inch squares or smaller. Of course, a uniform method and period of shaking are also necessary to get comparable extractions.

When adding the alcohol, run it slowly down the side of the vial, so as to form a layer on top of the mixture of extract and Potash Solution No. 1. If alcohol is not added properly, then a lower than normal reading may be obtained, especially in the lower ranges. After adding alcohol, let vial stand for one minute to start precipitation, be-

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PICTORIAL

Queen o' Wheat

Above: Harvesting beans in Pennsylvania.

Below: Wheatfields near Moscow, Idaho.

Above: Sweet corn for a Washington cannery.

Below: One of Wisconsin's fertile valleys.

Above: Buckwheat in blossom.

Below: Turnips for seed.

The Editors Talk

Science in Agriculture

"Agriculture cannot afford to remain static in an ever-changing national economy. And science can be enlisted to serve all farm people more effectively. This would involve greater emphasis on research, educational, and other programs that will reduce total costs on farms, facilitate production shifts needed to restore and hold economic balance between production and market outlets, and improve farm living conditions both in the home and the community."

This is the conclusion reached by Sherman E. Johnson of the Bureau of Agricultural Economics, U. S. Department of Agriculture, in his interesting discussion on "Who Benefits from Improved Farm Technology" appearing in the April 1950 issue of the Agricultural Situation. In reaching it, Dr. Johnson takes cognizance of the need for fewer farm workers and their incorporation into other industries, the problems of surpluses, and what determines which farmers benefit and which do not. He logically answers many of the questions constantly coming to mind in a review of our changing agricultural picture.

The most dramatic and widely recognized achievement resulting from the application of science to agriculture, he says, is the rapid increase in the physical productivity. Total output from our farm plant in 1949 was twice as large as at the turn of the century. One farm worker now produces enough for himself and 14 other persons, whereas 50 years ago he produced enough for himself and only seven others. This means that the total income to agriculture is divided among fewer farm people.

The release of workers from agriculture has furnished the labor force for the development of our urban industry, helping provide the basis for our high level of living. The long-time benefits of such shifting perhaps can best be seen in contrasting the situation in this country with the areas of the world in which half or more of the working population is engaged in farming.

Reductions in costs of production have been greater and more widespread than generally is recognized. This has been particularly true when improvements in technology have been adopted in combinations. To illustrate, a Corn Belt farmer adopts mechanical power along with hybrid seed corn, commercial fertilizer, and more legumes in the rotation; all of which result in higher yields of corn and other crops. These, in turn, make more feed available for livestock and better feeding than can be combined with other improvements in livestock practices. As a result of this combination, the farm family is able to do all of the work with little or no hired labor. Investment and current operating expenses for power and machinery are little if any higher than when the farm was operated with animal power and considerable labor was hired to get the work done on time. Production per farm, per acre, and per worker are increased at the same time that operating expenses are being reduced.

Although improved technology has lessened the drudgery on the farm and in the home and provided conveniences and time for better community life, it still has by-passed many farms and farmers. Also, the rapid increase in agricul-

tural production has not been an unmixed blessing, as is being seen in the building up of surpluses relative to production of farm products, especially in the postwar years. Under what conditions are the benefits retained by farmers or are passed on to other groups? What determines which farmers benefit and which do not? Dr. Johnson says the answers to these questions lie in the extent to which a technological change lowers cost of production and increases output of farm products, and on the effect higher production has on prices farmers receive.

Farmers who have lowered their total production costs at the same time that production has been increased are in an excellent position to retain much of the benefits resulting from their improvements. Prices would have to drop enough that total gross income would be lower than before the improvement was adopted to wipe out their gains. Dr. Johnson does not think that price declines resulting from technological changes are likely to be that large.

He finds that the economic effects of such changes in farming during the past do not indicate that we should place any brakes on the development of more efficient farming in the future. Individual farmers who adopt cost-reducing combinations are likely to gain from them, both immediately and over a period of time, whether or not they result in increased output. Although the benefits of technology have been unequally distributed and serious problems have been created, the problems can be solved and the inequities minimized.

That science will continue in this role is assured by the new results of research constantly being put into practice. And the surface of the possibilities has just been scratched.

Farm Safety Week July 23-29

To those of us with farm backgrounds and old enough to remember when the Fourth of July was a *real* "hurrah" day, there may be a special significance to the observance of a National Farm Safety Week in the latter part of July. Countless were the accidents stemming from Fourth celebrations—and finally we have saner Fourths.

Countless have been and still are the accidents on our farms. Perhaps if the majority were confined to one single day, greater progress in their reduction would be made. However, farming is a year-round industry, highly mechanized and intensified. It has moved up from the 4th to the 3rd most dangerous way of making a living, and in 1948 (latest figures available) statistics show that 1,600,000 farm residents were killed or injured. Nearly 900,000 of these accidents happened in the home; another 300,000 while the farmer or his family was at work; and about 230,000 accidents were the result of motor-vehicle smash-ups.

These figures in their summation are startling and call for a greatly stepped-up consciousness of the hazards in country life. It is fitting for the President to issue his proclamation for a National Farm Safety Week, July 23-29, 1950, in which all agencies and organizations, civic groups and individuals are requested to "encourage the study and observance of farm safety rules during the designated week and throughout the year."

Safety is the responsibility of all. Not only do we owe ourselves a keen awareness of it, but we are duty-bound to spread this awareness to those who in the pressure of their work are apt to become forgetful.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay[1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	31.0	38.7	153.0	219.0	136.0	205.0	19.00	67.80	....
1949									
June.....	30.13	31.5	175.0	264.0	121.0	186.0	16.40	46.70	....
July.....	30.08	56.5	155.0	283.0	125.0	182.0	15.65	37.50	....
August.....	29.32	44.6	154.0	267.0	118.0	179.0	16.05	44.40	....
September...	29.70	48.7	138.0	230.0	116.0	187.0	16.25	43.50	....
October.....	28.70	47.4	130.0	196.0	109.0	189.0	16.75	41.80	....
November...	27.76	43.4	134.0	189.0	102.0	190.0	16.75	42.30	....
December....	26.50	45.4	131.0	202.0	113.0	193.0	17.15	43.30	....
1950									
January.....	26.47	39.7	136.0	215.0	115.0	192.0	17.15	43.60	....
February....	27.50	34.1	133.0	221.0	116.0	193.0	16.75	43.60	....
March.....	28.05	32.0	132.0	222.0	119.0	198.0	16.45	43.00	....
April.....	28.74	....	134 0	228.0	126.0	201.0	16.65	44.40	....
May.....	29.24	48.5	128.0	228.0	134.0	204.0	17.25	45.20	....

Index Numbers (Aug. 1909—July 1914 = 100)

1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	89	81	109	74	87	110
1938.....	69	196	80	79	76	64	57	97	88
1939.....	73	154	100	84	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	105	117	107	82	211	129
1942.....	153	369	168	134	143	124	91	202	163
1943.....	160	405	188	235	174	154	125	231	245
1944.....	167	420	214	216	170	160	139	234	212
1945.....	181	366	205	232	198	170	127	227	224
1946.....	263	382	178	248	212	209	141	319	204
1947.....	257	380	232	248	336	259	148	381	249
1948.....	250	387	220	249	212	232	160	301	238
1949									
June.....	243	315	251	301	188	210	138	207	175
July.....	243	565	222	323	195	206	132	166	185
August.....	236	446	221	305	184	202	135	197	174
September...	240	487	198	263	181	212	137	193	205
October.....	231	474	187	224	170	214	141	185	170
November...	224	434	192	216	159	215	141	188	213
December....	214	454	188	230	176	218	144	192	196
1950									
January.....	213	397	195	245	179	217	144	193	261
February....	222	341	191	252	181	218	141	193	203
March.....	226	320	189	253	185	224	139	191	169
April.....	232	.	192	260	198	227	140	197	205
May.....	236	485	184	260	209	231	145	200	178

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2 46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
June	3.19	2.28	9.65	13.34	10.02	9.71
July	3.19	2.32	11.07	14.97	11.53	10.78
August	3.19	2.32	11.88	14.49	12.75	12.14
September	3.19	2.32	9.83	14.53	11.53	11.53
October	3.08	2.32	9.94	14.58	11.29	11.65
November	3.00	2.32	10.39	14.21	10.39	10.78
December	3.00	2.32	12.94	13.88	9.87	9.94
1950						
January	3.00	2.32	10.27	13.79	10.26	10.08
February	3.00	2.32	9.37	13.45	8.96	8.96
March	3.00	2.32	9.70	13.01	10.17	9.34
April	3.00	2.32	10.34	12.58	10.39	8.19
May	3.00	2.05	10.74	11.97	10.14	7.59
	Index Numbers (1910-14 = 100)					
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
June	119	80	276	378	297	276
July	119	81	316	424	342	306
August	119	81	339	410	378	345
September	119	81	281	412	342	328
October	115	81	284	413	335	331
November	112	81	297	403	308	306
December	112	81	311	393	293	282
1950						
January	112	81	293	391	304	286
February	112	81	268	381	266	255
March	112	81	277	369	302	265
April	112	81	295	356	308	233
May	112	72	307	339	301	216

Wholesale Prices of Phosphates and Potash * *

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1925	.600	2.44	6.16	.584	.860	23.72	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
June	.770	3.66	7.06	.330	.634	12.76	.176
July	.770	3.60	5.87	.353	.679	13.63	.188
August	.770	3.60	5.47	.353	.679	13.63	.188
September	.770	3.65	5.47	.353	.679	13.63	.188
October	.770	3.75	5.47	.375	.720	14.50	.200
November	.770	3.76	5.47	.375	.720	14.50	.200
December	.770	3.76	5.47	.375	.720	14.50	.200
1950							
January	.762	3.76	5.47	.375	.720	14.50	.200
February	.760	3.76	5.47	.375	.720	14.50	.200
March	.760	3.76	5.47	.375	.720	14.50	.200
April	.760	3.76	5.47	.375	.720	14.50	.200
May	.760	3.76	5.47	.375	.720	14.50	.200
			Index Numbers (1910-14 = 100)				
1925	110	68	126	82	90	98	74
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
June	144	101	145	62	67	53	80
July	144	100	120	65	71	56	82
August	144	100	112	65	71	56	82
September	144	101	112	65	71	56	82
October	144	104	112	68	76	60	83
November	144	104	112	68	76	60	83
December	144	104	112	68	76	60	83
1950							
January	142	104	112	68	76	60	83
February	142	104	112	68	76	60	83
March	142	104	112	68	76	60	83
April	142	104	112	68	76	60	83
May	142	104	112	68	76	60	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1925.....	156	153	151	112	100	131	109	80
1926.....	146	150	146	119	94	135	112	86
1927.....	141	148	139	116	89	150	100	94
1928.....	149	152	141	121	87	177	108	97
1929.....	148	150	139	114	79	146	114	97
1930.....	125	140	126	105	72	131	101	99
1931.....	87	119	107	83	62	83	90	99
1932.....	65	102	95	71	46	48	85	99
1933.....	70	104	96	70	45	71	81	95
1934.....	90	118	109	72	47	90	91	72
1935.....	109	123	117	70	45	97	92	63
1936.....	114	123	118	73	47	107	89	69
1937.....	122	130	126	81	50	129	95	75
1938.....	97	122	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	123	130	127	86	56	130	102	77
1942.....	158	149	144	93	57	161	112	77
1943.....	192	165	151	94	57	160	117	77
1944.....	196	174	152	96	57	174	120	76
1945.....	206	180	154	97	57	175	121	76
1946.....	234	197	177	107	62	240	125	75
1947.....	275	231	222	130	74	362	139	72
1948.....	285	250	241	134	89	314	143	70
1949								
June.....	249	242	223	134	99	304	144	65
July.....	246	240	225	140	100	349	144	68
August....	244	238	222	143	100	372	144	68
September.	247	238	225	138	100	334	144	68
October...	242	237	222	138	98	331	144	72
November.	237	236	221	136	96	321	144	72
December..	233	237	221	136	96	317	144	72
1950								
January...	235	238	221	135	96	316	142	72
February..	237	237	223	132	96	286	142	72
March....	237	239	223	134	96	305	142	72
April.....	241	240	223	135	96	313	142	72
May.....	247	244	228	132	91	311	142	72

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] **Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.**

[2] **All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.**

** **The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizing Materials, 1949," Calif. Dept. of Agri., Bur. of Chem., Sp. Bul. 236.

"Poultry Manure as a Fertilizer for Vegetable Crops," Agr. Exp. Sta., Univ. of Del., Newark, Del., Bul. 281, Dec. 1949, E. M. Rahn.

"Tomato Yield and Grade as Affected by Variety, Irrigation and Fertilizer," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Bul. 277, Dec. 1949, J. E. Kraus.

"Using Fertilizers Right," Agr. Ext. Serv., Iowa State College, Ames, Iowa, Pamph. 154, Feb.. 1950, H. B. Cheney, W. H. Pierre, H. R. Meldrum, W. J. Fitts, L. C. Dumenil, M. A. Anderson, and F. F. Riecken.

"Fertilizers Boost Yields of Small Grains, Grasses, and Legumes," Agr. Exp. Sta., Iowa Agr. Ext. Service, Iowa State College, Ames, Iowa, Bul. P100, Nov. 1949, L. B. Nelson and H. R. Meldrum.

"Some Fertilizer Experiments with Deciduous Forest Tree Seedlings on Several Iowa Soils," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Res. Bul. 369, Nov. 1949, A. L. McComb.

"Commercial Fertilizers, 1949," Agr. Exp. Sta., Orono, Me., Offic. Insp. 213, Oct. 1949, J. M. Banton.

"Commercial Fertilizer Report for 1949," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Bul. 469, Jan. 1950, A. R. Anderson and P. C. Gaines.

"Commercial Fertilizers," 20th A. R. New Mexico Feed and Fertilizer Control Office, Year ending Dec. 31, 1949, State College, N. M., R. W. Ludwick and L. T. Elliott.

"Ohio Fertilizer Recommendations 1949-50, for Field Crops, Permanent Pastures, and Hay Fields," Agr. Ext. Serv., Ohio State Univ., Columbus, Ohio, Bul. 305, Feb. 1949, E. Jones and G. W. Volk.

"Response of Field Grown Tomatoes to Radioactive Materials," Agr. Exp. Sta., Pa. State College, State College, Pa., P. R. 27, Mar. 1950, R. E. Larson, B. L. Pollack, and H. K. Fleming.

"Efficient Use of Lime for the Farm," Agr. Ext. Serv., Pa. State College, State College, Pa., Cir. 340, Sept. 1949, J. B. R. Dickey.

"Insecticide-Fertilizer Mixtures for Corn," Clemson Agr. College, Clemson, S. C., Cir. 352, Mar. 1950, H. A. Woodle and W. C. Nettles.

"The Inspection of Commercial Fertilizers and Agricultural Lime Products for 1949," Univ. of Vt., Burlington, Vt., Rpt. 13, Nov. 1949, L. S. Walker and E. F. Boyce.

"Commercial Fertilizers—1950," State Dept. of Agr., Madison, Wis., Bul. 300, Mar.-Apr. 1950, W. B. Griem.

"What Fertilizer Should I Use?" Univ. of Wis., Madison, Wis., Sp. Cir. 13, Oct. 1949, E. Truog, C. J. Chapman, and K. C. Berger.

"Boron in Canadian Agriculture," Dept. of Agr., Summerland, B. C., Canada, Sci. Cont. 172, C. G. Woodbridge.

Soils

"The Contour-Check Method of Orchard Irrigation," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Cir. 73, Dec. 1949, J. B. Brown and J. C. Marr.

"The Illinois Soil-Testing Program," Agr. Exp. Sta., Univ. of Ill., Urbana, Ill., AC 1388, Feb. 1949, R. H. Bray.

"A Key to Kentucky Soils," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Cir. 64, Nov. 1949, W. S. Ligon and P. E. Karraker.

"Redwood County Soils Need Fertilizers; Results of Trials 1946-1949," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., Soil Series No. 30, Jan. 1950, J. I. Swedberg and E. R. Duncan.

"Fertilizer Trials in Mower County, 1949," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., Soil Series No. 31, Mar. 1950, H. F. Arneman and A. C. Caldwell.

"The Effect of Tillage Method on Soil and Moisture Conservation in the Plains Area of Northern Montana," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Bul. 468, Dec. 1949, T. S. Aasheim.

"Know Your Soil," Ext. Serv., Okla. A & M College, Stillwater, Okla., Cir. 509, S. Brown.

"An Economic Report on Submarginal Land," Agr. Exp. Sta., Ore. State College, Corvallis, Ore., Info. Cir. 471, Jan. 1950, C. V. Plath.

"Soil Survey, Lee County, Alabama," Series 1938, No. 23, USDA, Washington, D. C., Feb.

1950, C. H. Wonser, M. M. Striker, L. G. Brackeen, C. L. McIntyre, and H. Sherard.

Crops

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Good Farmers Make Good Soils

Whether cropland improves or runs down is mainly a matter of how the farmer—good or bad—manages it, according to Dr. B. T. Shaw of the U. S. Department of Agriculture. The idea of "virgin" soils being good agricultural soils is not always true, says Dr. Shaw, Deputy Administrator of the Agricultural Research Administration. In most cases virgin soil calls for a period of management to bring out and improve its productive possibilities.

Under cropping, Dr. Shaw told a New England audience recently, soils

tend to approach a fairly stable level of productivity "which represents a balance between down-grade processes such as removal of nutrients and loss of organic matter, and upgrade processes such as gain in nutrients and organic matter from residues, manure, fertilizers, and rock weathering."

"With a cultivated crop like corn grown continuously without fertilizers or manure for long periods, the yield does not drop to zero but levels off at about 9 or 10 bushels to the acre," Dr. Shaw continued. "This is what has happened in many old countries with dense population and under-developed agriculture. With annual additions of 5 tons of manure, the equivalent yield of continuous corn is raised to about 30 bushels to the acre. When corn is grown in a rotation with clover and the land is limed so that clover will grow, the equilibrium yield is also about 30 bushels to the acre.

"When both lime and manure are used on the rotation, corn yields are raised to about 50 bushels per acre. When fertilizers are used also the equilibrium yield can be pushed still higher. Thousands of farmers have demonstrated that it is possible to produce rather consistently corn yields of 100 bushels per acre in all of the Corn Belt and in many other states."

Alfalfa—Its Mineral Requirements . . .

(*From page* 12)

the fundamental principles of ecology. If such mixtures are not managed so that the alfalfa has the advantage, the legume will ultimately lose out to the grasses. This argues in favor of heavy topdressings of K and none of N.

Fall Root-reserves Highly Important

In certain soils of the humid region, alfalfa roots do not penetrate the subsoil because of such factors as acidity, high water table, or solid rock. Under such conditions, yields during the summer months are dependent upon current rainfall.

For production of this crop, 1 to 1.5 inches of water in a 10-day period has been given as a critical level. The total rainfall greatly exceeded the critical level during the course of the field experiment, yet there were fall periods of 1 to 2 months' duration when lack of water was a seriously limiting factor. These periods were usually after the last cutting had been removed. Such drouths prevent adequate development of root-reserves to tide the alfalfa over during the winter and early spring.

One of the most important factors in determining the longevity of alfalfa in eastern United States is the amount of carbohydrate food reserves that are stored in the roots when winter sets in. If the growth after the last cutting is limited, whether by drouth, disease, insects, nutrient deficiencies, or lack of time for adequate growth, the plants may not be able to survive the winter or to get off to a good start in the spring.

Roots increase progressively in size and in their reserves of food materials to the seed-pod stage of the plants. Once the crop is harvested or the tops are killed by low temperatures, any new growth is at the expense of these reserves until leaves are well developed. The length of life of alfalfa can be shortened by cutting too early during this new period of growth, too frequently, or so late in the fall that there is too little time for restoring the root reserves.

During 1948, the plots were harvested June 10, July 15, and August 30. But small areas in three plots were cut an extra time on August 11. Not

TABLE XII.—EFFECT OF VARYING K APPLICATIONS ON 1948 STAND OF ALFALFA. ACRE YIELD OF TOPS AND ROOTS, WEIGHT PER ROOT, ACRE WEIGHT OF ROOTS IN SUBSOIL, AND K, N, AND NA CONTENT OF ROOTS.

K_2O per A.*	Number of Plants per A.	Yield of Tops	Yield of Roots	Weight per Root	Weight of Roots in subsoil	Elements in Roots		
						K	N	Na
		lb.	*lb.*	*gm.*	*lb.*	*per cent*	*per cent*	*per cent*
0	65,500	4,930	455	3.10	61	0.20	1.65	0.58
60	218,000	7,080	1,638	3.40	348	0.27	1.80	0.37
120	290,600	7,890	2,174	3.39	464	0.31	2.10	0.23
180	370,500	8,570	3,591	4.40	511	0.35	2.50	0.18

* All plots received standard applications of P and B.

a single live alfalfa plant remained on any of these small areas that fall. Removal of the late fall growth after a killing freeze had no effect on survival of the plants, however, and no difference in yield was noted the following spring. If this late-fall crop is removed, additional fertilizer should be applied.

Yellowing a Common Symptom of Deficiencies

Anything that interferes with photosynthesis limits root development and increases the plant's susceptibility to drought and winter-injury. Yellow and diseased leaves do not permit storage of root reserves. Not only time of cutting but nutrient deficiencies, diseases, and insects have important effects. Nutrient deficiencies greatly limit both root and top growth. These have far-reaching consequences in the overwintering of alfalfa (Table XII).

K deficiency in alfalfa is indicated by characteristic spotting around the edges of the leaflets. These spots may disappear in midsummer, but the plants turn yellow. If 15 per cent or more of the plants show such evidence of deficiency, marked response to K treatments is to be expected.

Low pH values also result in yellowing. B, N, and Mn deficiencies, of which yellow foliage is the common symptom, have all been observed in New Jersey. In severe B deficiency, red tends to dominate over yellow. Fe deficiency likewise results in yellow alfalfa. One of the most common causes of alfalfa yellowing is leafhopper injury.

Potash Tissue Test for Peach Leaves

(*From page* 22)

fore mixing in the alcohol. This seems to increase the sensitivity. Then mix in the alcohol by a slow rotary motion.

Summary

The modified Purdue potash tissue test serves well as a simple, on-the-spot diagnostic tool for checking on the potassium content of peach leaves. This procedure is not presented as a perfectly calibrated tissue test even for all varieties of peaches. We believe, however, that it can be used to search out low potash orchards or areas in orchards even before the potash deficiency symptoms appear.

Further Photographic Hints . . .

(*From page* 16)

since you can arrange the lights and obtain a fair idea how the finished picture will look. This type of setup comes in handy where such subjects as potted plants, etc. are concerned. For determining exposure, obtain some Eastman Kodaguides. These are small plastic calculators and are made to be used with flash as well as photoflood. Follow the directions and you will usually get good pictures.

Copying

The agricultural worker runs into almost every type of photography at one time or another, but he is almost sure to need charts, graphs, or pictures copied fairly often. If your camera is equipped with a ground glass, the process is simple. If a picture is to be copied, simply focus upon it and take the picture with ordinary film. For such close-ups you will have to increase your exposure. The closer you focus, the more you will have to increase your exposure time. For light you can use two photoflood lamps, but the writer has found that sunlight is hard to beat. With direct sunlight outside in the open you have absolutely even illumination, which is often difficult to obtain with artificial light. This is especially true when copying line drawings. Some special instructions are needed for copying line drawings made with india ink or black and white drawings in books. If properly done, such photographs of drawings or charts are just as good as the original or even better since the contrast is increased. For this type of work use Process Film. This is a slow film giving great contrast. The makers of the film recommend a special developer and this is best. However, very satisfactory results may be obtained by developing it in ordinary paper developer (D-72) for about four minutes at 75 degrees F. Your exposure for a chart two feet square photographed with a 4 x 5-inch film in bright sunshine should be about 1/25 second at f.16. Now if there are tiny transparent spots on the negative or parts that you wish to remove before printing, this may be done with a fine brush dipped in photographers' opaque.

The following table will aid you in determining the proper exposure for copy work or any other close-up taken in sunlight. First determine the correct exposure for an ordinary picture, then calculate from the table how much to increase it for the close-up.

Picture size on the ground-glass	*Multiply exposure by*
1/8 natural size	1.25
1/4 natural size	1.6
1/2 natural size	2.3
3/4 natural size	3.
Natural size	4.

Darkroom Technique

Actually the whole science of photography centers about the darkroom, and the subject is far too extensive to be covered here. However, there are a few things under this heading that might be mentioned here. One of these is the question of tank-versus-tray development. In tray development the film is placed in a tray and the tray is rocked back and forth to secure even development or, in the case of roll film, the film is "sawed" up and down in the solution. This was standard procedure in the old days of slow film when the process could be watched with a red safelight, but with modern, high-speed films you can't use a safelight bright enough to see anything and so there is no advantage in using tray development. With tank development the film is placed in a tank, developer of a standard temperature is poured in, and development is carefully timed. The point that it is desired to bring out is that there are already too many variables in photography before you get

to the darkroom, so try to standardize your darkroom technique. You can't always control the light that you make pictures by but you can use the same time-temperature relationships. This, at least, takes a part of the guesswork out of photography.

One thing that causes more difficulty in a darkroom than almost any other is the sloppy habit of using trays, tanks, and other utensils that are not clean. Photographic chemicals are hard to wash off, but if they contaminate developer you can expect all sorts of strangely colored spots and stains to appear on your pictures. Also, make it a practice to have clean towels easily available and rinse off your hands before you dry them.

Last, but not least, study the directions that come with each package of paper or film. The manufacturer is anxious for his product to show up well and has therefore prepared the directions for its use very carefully. Follow them exactly for best results.

Those Were the Days

(*From page* 5)

act and kept it up forever after, until the last curtain flopped. The roof of the old shack was made of some sheet metal, and it hailed a staccato along with the rolling thunder. I do not think we were able to make the anxious audience catch our words at all, even if they hadn't been busy wondering if their barns were struck or their chickens drowned. It was still raining hard when the great drama ended, so farm folks stuck around for half an hour or more with grim comments over the waste of 50 cents apiece. We of the notable cast curled up on the stage and tried to slumber, using lap-robes and coats for pillows. By morning we pried our eyes open and bundled off homewards without breakfast with all the experience of traveling Thespians. It was my last stage appearance —talent crushed by the elements.

One sometimes goes back along the trails of youth to catch a fleeting glimpse of what used to be. After the mud from the spring thaw receded, I was wont to ramble in my snorting-six over the cement causeway known of old as the tollgate plank road. It leads into the town where I was fetched up by hand, but which possesses other nobler distinctions to stimulate its pride.

Only once in recent years of driving through this town of my schooldays have I met one of the old-timers. She did not look at all like an old-timer is supposed to look. She had retained her beauty and grace much as we boys admired these attributes of hers in other days. She is therefore not a landmark of ancient times, but an ever-lovely reminder that good things improve with age and life's experiences. She was kind enough not to make any too personal comments about myself in contrast to the young parts we shared in the famous theatricals.

Beginning at the head of the avenue there stands the courthouse of dun-colored brick, topped by a squatty dome having an effigy of Justice with her sword and scales. In childhood I lived in a canary yellow cottage trimmed with red oxide barn paint, about three blocks from this seat of judicial dignity. Justice still stands a bit askew like some of the decisions in this and other courts, but for all I can see she is just as stiff, unbending, and blind as ever.

I go in for awhile to visit with the county agent—an official unknown in our rugged days of independent ruralism. I found him ensconced in the still dingy basement, where my father used to preside over the post of the Grand Army. Those shadowy heroes of Manassas and Gettysburg, once robust and jocular, have long since gone from

the spot so long alive with repartee and martial music. Perhaps it is fancy, but above the whiff of the county agent's spray dope and chemicals, there seemed to linger a ghostly vestige of fried-cakes and coffee—an aftertaste of those delectable suppers served by the ladies of the Relief Corps during the G. A. R. festivities.

I go out for a moment to the steep stone steps flanked by wrought-iron railings. The steps are worn concave by the footfalls of countless litigants and taxpayers. It was on these old steps that the old soldiers used to assemble for their annual photograph. The operator of the camera stood below and used a wet-plate negative and a long-time exposure. One of those prints shows myself as a kid in plush coat and round straw hat perched beside my Dad prior to the Decoration Day parade—where I also hiked beside the colors held aloft by Comrade Blowers, right behind the silver cornet band.

Today this little city is inhabited by hundreds of heroes—men of the last two world wars, who have their posts and their big parades and their small boys in haste to keep step with an age of atom bombs and machine guns. In due time it also will gather newer and mellower memories, so that the ones which I speak of will vanish and become legendary like a page in the files which is seldom read. Maybe our means of defense have improved in these intervals, but our moods of deference have not. The flags and the flowers and the fortitude—nothing has changed but the cracks in the buildings and the wrinkles on our faces.

It is down this same street of elms and maples that I saw my first horseless carriage, glimpsed Buffalo Bill and Annie Oakley, cheered the minstrel show parades and the circus pageants, and walked to school with young companions. On the elementary school "campus" five blocks beyond the court house, we experienced minor ailments of soul and body, such as wistful heartaches caused by an indifferent miss in

Time Proven LaMotte Soil Testing Apparatus

LaMotte Soil Testing Service is the direct result of 30 years of extensive cooperative research with agronomists and expert soil technologists to provide simplified soil testing methods. These methods are based on fundamentally sound chemical reactions adapted to the study of soils, and have proved to be invaluable aids in diagnosing deficiencies in plant food constituents. These methods are flexible and are capable of application to all types of soil with proper interpretation to compensate for any special soil conditions encountered.

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pigtails, or hurrying homeward with a green-apple bellyache.

Here I learned to fly kites, play marbles for "keeps," turn handsprings, and play one-old-cat with a string ball; and got my first lectures by sly, older boys about the origin of species and such elementary facts of biology. Here the firemen of the fair city erected a 90-foot pole and tested their pumper by throwing streams of water toward its crest. Here the football teams practiced and we loyally rooted for them at home and abroad, even when it meant a defeat by 56 to 0 from a rival county seat high-school team bent on neighborly mayhem.

OH, naturally, the city fathers have yielded to modernity and higher educational standards since my time—and well they should, if some of us are the specimens of cruder ways. So today there are two big buildings on that city square—the old high school made famous by us who studied there, and the newer structure that elbows the former high school back into secondary rank and devotes its fabled halls to the tutelage of lower graders.

Teaching is swifter, livelier, more direct and forceful, calls on the latent imaginations of the bright young things and shames the laggard into action. It is no doubt a finer science than our old-time instructors ladled out, but believe me some of those teachers of ours had character and stamina—and such things really count for more than technical and factual equipment.

I suppose by new measurements, our precise old principal would be looked upon as a "queer coot." But he had his points and his merits. What he lacked in skill he made up for in honesty and painstaking zeal. And I shall always speak well of him because about 20 years after I graduated and had moved away, he had the grace and kindness to attend my mother's funeral in the old home town. Those old-time teachers were not mere visiting authorities, but they came to be a part of the fabric of the community whose children they "adopted" for moral as well as intellectual advancement.

Our elder generation can match all these rambling observations by recollections of countless towns whose high-school classes have held far too few reunions in a long span of time. Many of the kids have departed the earth, others have proved that their schooling was good by what they have accomplished in rearing good families and performing good work.

Yes, and many of our generation never finished high school. Even they, with ambition, character, and energy, have turned to good account all the fragments of learning they were able to find as far as the "Grammar School." A minority have pushed on to the finishing academies and colleges and universities, taking various letter degrees, and winning coveted scholastic tribute.

YET behind it all lies the ability to think back and concede that America was a great place to grow up in, through those calmer periods of our history. Maybe we former grads of less disturbing times are a trifle to be envied. High schools and colleges did not manufacture so many job-hunters with top level ambitions then. Life was quieter, less complex and contradictory. Yet the same spiritual values persist to be guided by, but too often the classrooms fail to stress them.

It's too late now to shout back to my former high-school mates about holding a get-together. They wouldn't do it. Too many other and more important things come first. Even a round-robin letter is a first-class nuisance and I'll not be guilty of beginning one. So we can take a mental farewell to them and a distant gesture of fraternal feeling. P. S.—I wonder if those plaster casts of Grecian statues still look down upon the kids in the old assembly hall. Or have they been marred and broken, like so many plans we laid in their presence 40 years ago?

TEXAS TABLE MANNERS

A Texas father was dining with his son in a Texas hotel, and in the course of dinner the son got into an argument with a cowboy. The cowboy called the son an offensive name, a very offensive name, and the young fellow grabbed his knife in his fist and started around the table to be avenged.

"Ain't ye got no table manners?" the old man hissed.

"But, pop, ye heered what he called me, didn't ye?"

"Yes, I heered all right, but that ain't no ground for yer forgettin' yer table manners. Put down that there knife and go at him with yer fork."

* * *

Sam: "Dey say dat de parrot am one o' the longest lived birds dere is."

Rastus: "Ah spects de reason fo' dat am, he ain't no good to eat."

* * *

A clergyman and a Scotsman were watching a football game together. The Scotsman continually kept taking nips from a bottle, and the clergyman, no longer able to restrain himself, at last cried out, "Sir, I'm sixty-nine years old, and never in my life have I touched alcohol."

"Well, dinnae worry yourself tae much," replied the Scotsman with a pronounced burr. "You're nae ginna start noo."

* * *

"My husband calls a spade a spade, you know."

"Well, my husband used to before he tried to dig up the garden."

* * *

TOO LATE

A spinster listened to a sermon on St. Augustine, who in his younger days was the most dissolute youth in Rome. Nevertheless he repented and became a noble leader of the church.

"Ah, yes," said the pastor in closing, "the greater the sinner, the greater the saint."

"Humph," muttered the old lady, "I wish I'd known that 40 years ago."

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The teacher was explaining the dolphin and its habits.

Teacher: "And, children, a single dolphin will have as many as two thousand babies."

Pupil: "Goodness! And how many do the married ones have?"

* * *

The other day a young fellow who had just gotten his first job as a truck driver on a highway met a luscious blonde.

"Say," he asked her. "How about a date for tonight?"

She looked at his downless face and said scornfully, "Say, I can't go out with a baby."

"Pardon me," the young man said, "I didn't know."

* * *

Junior: "Pa, the teacher says fertilizer stimulates plant growth like food makes boys and girls grow. Do you think it does, Pa?"

Farmer: "Can't say for sure, Son. I've never been able to understand whether the stuff actually stimulates the plants or whether it's just so downright repulsive that they try to grow away from it."

* * *

"Do you ever long to be a barefoot boy again?"

"Not me, lady. I work on a turkey ranch."

* * *

He: "Baby your eyes fascinate me. They got dew in them."

She: "That ain't do boy, that's DON'T."

A colored minister was telling his congregation about Solomon. "And you know," he said, "he had a thousand wives and every day he fed them on milk and honey!" A slightly-beyond-middle-aged man in the rear of the church interrupted him saying "Pahson, us aint interested in what Solomon fed his women; what us wants to know is what did Solomon eat HISSELF?"

* * *

It was just a week before election and the politician was growing eloquent in addressing a group of farmers. "I'm for soil conservation, too," he shouted. "We must save the soil for posterity."

A farmer in the back row turned to his neighbor and mumbled: "It seems like I'm 'way ahead o' him. Heck, out at my place I got a whole house full o' posterity right now."

* * *

An Italian shopkeeper received a Black Hand letter, reading:

"Leave $500 in cigar box at back door before Sunday night or we will steal your wife."

"No gotta $500 but I like-a your proposish."

* * *

"Did you interview the Congressman?"

"Yes."

"What did he say?"

"Nothing."

"I know that—but how many columns of it!"

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